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THE MANUFACTURE OF BRICK CHEESE

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INTRODUCTION

Brick cheese, which is said to have first been made in the United States, is a sweet-curd cheese, made from fresh, sweet milk. When it is properly made and cured, brick cheese is softer than Cheddar cheese, but is firmer than Limburger. It is mild and sweet in flavor and lacks the sharpness of Cheddar and the strong flavor of Limburger, although possessing something of the flavors which distinguish these well-known varieties.

It is used for sandwiches and cooking purposes because it slices without crumbling and melts quickly and smoothly when it is heated. It keeps for weeks at 55° F. after it is properly cured and ready for use. If it is held at a low temperature (40°) it can be kept without spoiling for a much longer period.

Many requests are received for information on the manufacture of brick cheese. It is the purpose of this publication to present briefly a description of the process of manufacture which is commonly followed in the leading brick cheese areas of the country. Although brick cheese is made chiefly in dairy plants, a good product can be made on the farm for home use by following these directions. The manufacture of this cheese on a commercial scale, however, should not be attempted by a novice without special instruction and experience in the art of cheesemaking. The reader should not assume that these brief instructions alone are adequate for operating a cheese factory. The art of cheesemaking is acquired only after experience in manufacture. Factory practice or vocational training in cheesemaking, such as is offered by colleges of agriculture in many States, should precede any considerable investment in building, equipment, or supplies. Local conditions should always be studied carefully before starting such an enterprise. Volume of milk, competition

from other buyers of milk, costs of manufacture, and market outlets are only some of the numerous factors that determine the financial success of cheesemaking operations.

EQUIPMENT

The following equipment is needed in addition to that commonly used in dairy-manufacturing plants: A cheese vat, apparatus for determining acidity in milk, a 100-cc graduate, a salinometer, curd knives, a curd rake, vat strainer, strainer pail, flat-sided curd pail, curd scoop, cheese forms or molds, a draining table, coarse burlap or draining cloth, either a salting table or a brine tank, and a paraffin tank. This equipment, except the draining table and the salting table or brine tank, which are usually made at the cheese factory, can be purchased from any dairy-supply house.

Figure 1 shows an ordinary, steam-jacketed cheese vat for factory use. A wash boiler or large dishpan in which the milk may be heated

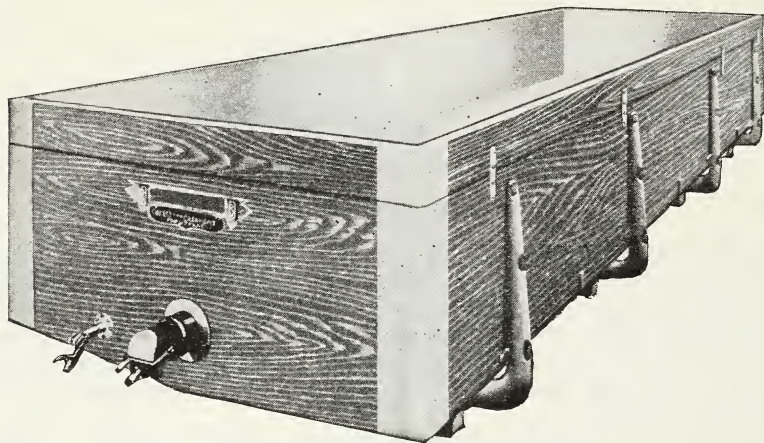


FIGURE 1.—A steam-jacketed cheese vat.

on a coal or wood stove can be used when making cheese on the farm. Figure 2 shows the other equipment, except the salting table and a brine tank which are shown on page 9.

Cheese forms, or molds, are made of either perforated metal or wood lightly grooved on the inner side, as shown in figure 3. Wooden forms are more commonly used because they retain the heat. Metal forms are more satisfactory from a sanitary standpoint as they are more easily cleaned. Either type is satisfactory. They should be 10 inches long by 5 inches wide by $5\frac{1}{2}$ inches deep, inside dimensions, without bottom or top. The follower is 10 inches long by 5 inches wide.

The draining table and the salting table or brine tank may be built of wood or of reinforced, waterproofed concrete. The draining table should have a flat, tight top, with raised edges along the sides and upper end; it should slope toward the open end, where two slanting lips direct the drippings into a whey tank or trough, not shown in the drawing. Enough coarse burlap should be provided to cover the draining table, and in cold weather enough extra to cover the cheese while it is draining.

The salting table has a level top with sides about the same height as the forms or molds, to help support the cheese after the forms are

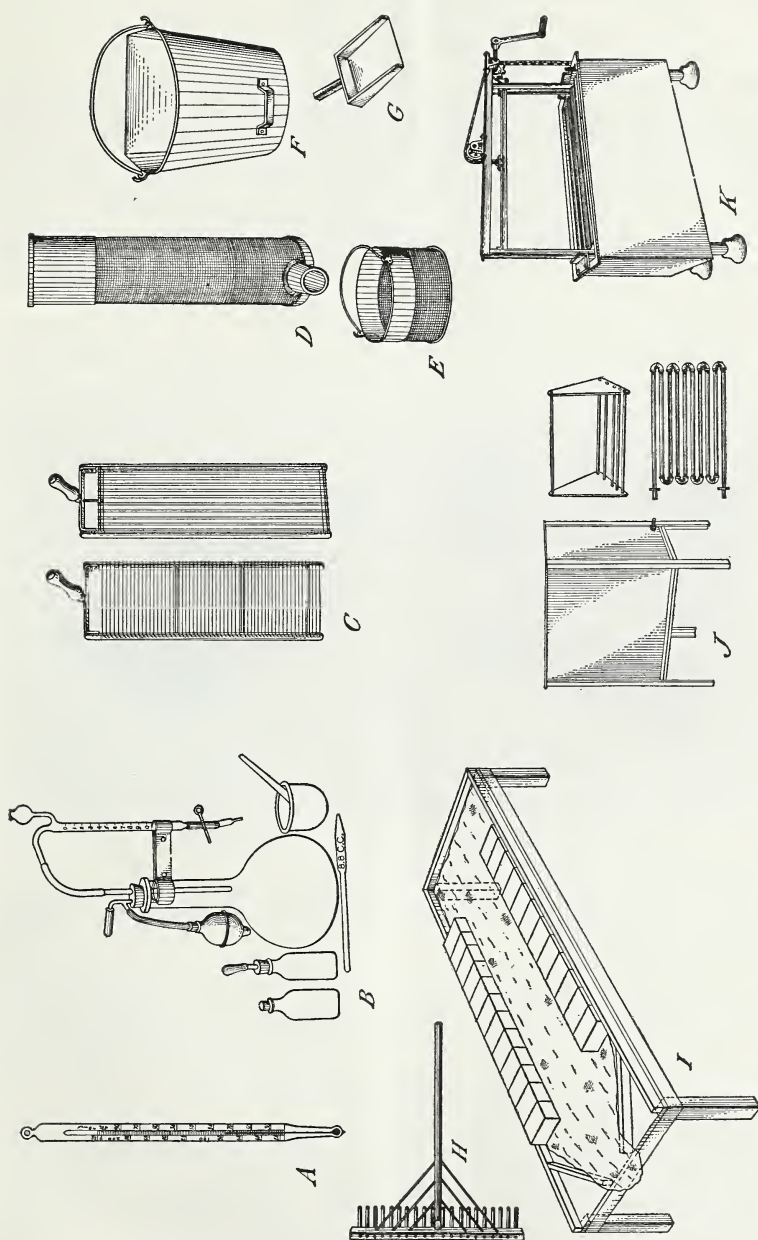


FIGURE 2.—Equipment required includes: *A*, floating dairy thermometer; *B*, apparatus for determining acidity in milk; *C*, curd knives; *D*, vat strainer; *E*, strainer pail; *F*, curd pail; *G*, curd scoop; *H*, curd rake; *I*, molds; draining cloth, and draining table; and *J*, a paraffin tank suitable for making cheese on a small scale or one (*K*) for large-scale work.

removed. A draining table 16 feet long by 4 feet wide, inside dimensions, and a salting table of the same size, will be large enough to take care of the cheese from 5,000 pounds of milk daily. If a brine

tank is provided instead of a salting table, a tank 15 feet long by 3½ feet wide by 2 feet deep, inside dimensions, will have sufficient capacity for cheese made from 5,000 pounds of milk.

QUALITY OF MILK

Brick cheese is made from whole milk. Since this cheese is a sweet-curd type, sweet milk that is clean in flavor is highly desirable. Milk containing undesirable flavors, as well as milk that has developed an appreciable amount of acidity or ripeness, should be rejected.

All freshly drawn milk has some acidity, the amount varying with different cows and conditions. If freshly drawn milk is not cooled and cared for properly, it will develop additional acidity as a result of the growth of micro-organisms. This increase in acidity is called "developed acidity" or "ripeness."

Brick cheese of the best quality is made from milk that contains not more than 0.01 percent of developed acidity. Brick cheese made

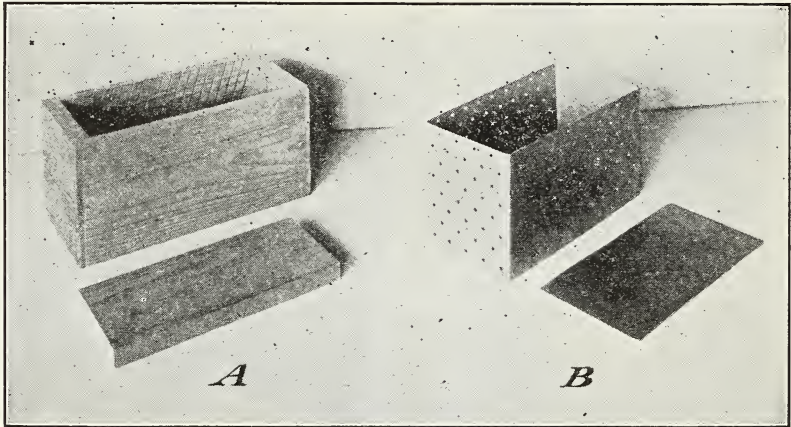


FIGURE 3.—Cheese forms and followers: A, wood; B, metal.

from milk that contains too much developed acidity will be sour in flavor and will have defects in body and color, which can be avoided by rejecting such milk.

If the cheesemaker is not certain that the milk delivered at his factory has been so handled that it contains no developed acidity, the ideal procedure would be to visit each farm occasionally and determine the acidity of the freshly drawn mixed milk from each herd. He would then multiply the pounds of milk produced on each farm by its average percentage of acidity to determine the pounds of acid produced on each farm. Then by dividing the total amount of acid produced on all the farms by the total pounds of milk produced on all the farms, he would obtain the average percentage of acidity in the freshly drawn milk from all the farms. A further determination of the acidity of the mixed milk in the vat at the cheese factory would indicate the amount of developed acidity.

A correct procedure for determining the acidity of the freshly drawn milk on the farm as well as of the mixed milk in the vat at the factory, is as follows:

With a pipette, measure 8.8 cubic centimeters of milk into the white cup (fig. 2, B).

Add 3 drops of the indicator (phenolphthalein) solution.

Run in the standard alkali or neutralizer solution, drop by drop, from the burette, while constantly stirring the milk, until all the mixture *first* turns a light pink color without fading. The pink color shows that all the acidity of the milk has been neutralized.

Read on the scale of the burette the number of cubic centimeters of neutralizer used. Each cubic centimeter of neutralizer represents 0.1 percent acidity. Thus, if 1 cc of alkali is needed to neutralize 8.8 cc of milk, the acidity of the milk is 0.1 percent.

A pipette holding 17.6 cc of milk may be used instead of the 8.8-cc pipette, in which case the reading is divided by 2.

ADDING THE STARTER

The use of a small amount of starter will tend to control the types of bacteria in the milk and will improve the quality of the cheese. A starter is a material, usually milk, which contains large numbers of living, lactic acid-producing bacteria. Clean milk may contain these organisms. Such milk, when it is soured at about 70° F., makes a good natural starter. But there is uncertainty with a natural starter since it may also contain undesirable types of bacteria along with the lactic acid types. There are laboratories which distribute cultures of the desirable organisms in some convenient form. These cultures are known as commercial starters and, when they are properly cared for, they can be grown in milk and transplanted from day to day for long periods. Directions for carrying such starters can be obtained from practically every State experiment station or from the laboratories which distribute the cultures.

The amount of starter should be varied according to the amount of developed acidity in the milk. When no acidity has developed, starter may be added at the rate of 2½ pounds per 1,000 pounds of milk (0.25 percent). When 0.01 percent acidity or more has developed, then 1 pound of starter for 1,000 pounds of milk (0.1 percent) will be enough. When the amount of developed acidity is not known, or it is impracticable to determine it as described above, it is not advisable to add more than 0.1 percent of starter to milk that contains 0.16 percent, or more, acidity.

The starter should be added not more than 5 to 10 minutes before the rennet is stirred into the milk.

Good cheese can be made on the farm without the addition of starter if the night's milk is kept clean and is cooled properly.

ADDING THE RENNET

The temperature of the milk when the rennet is added should be from 88° to 92° F. determined with an accurate thermometer (fig. 2, A). Add enough rennet to develop a firm, jellylike coagulation in from 30 to 35 minutes; usually from 75 to 90 cc of rennet per 1,000 pounds of milk is sufficient. The rennet should be diluted in 20 times its volume of cold water and then thoroughly mixed in the milk by stirring for about 3 minutes. After the rennet is added and thoroughly stirred in, the milk must stand undisturbed until it has

coagulated. Jarring or otherwise causing the milk to move will result in a weak, grainy coagulation, and the whey will separate from the curd before the curd is ready to be cut.

When a small volume of milk is used, as in making cheese on the farm, add from 1 to 2 teaspoonfuls of rennet to each 50 pounds of milk.

CUTTING THE CURD

When the curd is firm and shows a clean break away from the side of the vat on being pressed with the back of the hand, it is ready to be cut. Another method of determining when the curd should be cut is to insert the index finger obliquely into the curd, then split the curd with the thumb and raise the finger gently as illustrated in figure 4. If it is ready to be cut, the curd will split over the finger

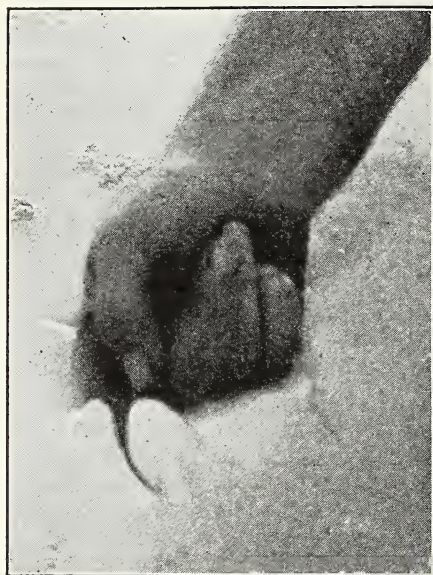


FIGURE 4.—Testing the curd for firmness by splitting with the finger.

as if cut by a knife and clear whey will quickly fill the opening. When the curd is in this condition, cut it lengthwise with the horizontal knife and then lengthwise and crosswise with the perpendicular knife. The curd may be cut with either $\frac{3}{8}$ - or $\frac{1}{2}$ -inch Cheddar cheese knives. The knives should be so handled that they will cut their way into and out of the curd.

HEATING THE CURD

Immediately after the curd is cut, agitation should begin. At this stage the curd is soft and tender, and should be stirred gently with the hands to avoid breaking the cubes, for from 15 to 25 minutes. At the end of this period it will be noticed that the curd has expelled considerable whey, that it is much firmer and will stand more vigorous

stirring without breaking. An ordinary wooden hay rake can be used for stirring the curd. Mechanical agitators are available for factory work on a large scale.

A small amount of steam is now turned into the jacket of the vat in order to raise the curd-whey mixture to the desired temperature in about 45 minutes. The final temperature to be attained will depend on the size of the cubes and the acidity of the milk. Large cubes require slightly higher cooking temperatures than small cubes. If no acid had developed in the milk at the time the rennet was added, a temperature of 108° to 110° F. will be required to obtain the desired degree of firmness in the curd. If the acidity had increased slightly over that of the fresh milk a temperature of only 106° to 108° is high enough. If the milk, however, had developed excessively high acidity the temperature should be raised to 115° in order to check acid

development in the vat. After the curd is cut and until the final cooking temperature is reached, the curd should be stirred constantly to insure an even temperature and to prevent lumping. Lumping or sticking together of the curd particles will cause uneven expulsion of the whey which will injure the texture of the cheese.

FIRMING THE CURD

After the final cooking temperature is attained a portion of the whey should be drawn off. Allow the curd to settle to the bottom of the vat; then push it gently a short distance back from the gate to permit the removal of the whey. The vat strainer and strainer pail, shown in figure 2, *D* and *E*, are then put in place. The vat strainer is placed in the gate of the vat to prevent the curd escaping with the whey, and the strainer pail is hung on the gate to catch any particles of curd passing through the gate. Whey is drawn from the vat until the curd is slightly exposed. The gate is then closed, and the contents of the vat are immediately stirred so that the curd is uniformly distributed in the whey that remains in the vat. The curd is then allowed to remain in this whey until it is firm enough to place in the molds or forms. This operation retards the cooling of the curd. A cold curd does not mat together well in the forms.

When the curd has reached the desired degree of firmness, which is usually from 20 to 40 minutes after the steam is turned off, the curd and whey are dipped into the forms. The curd particles will be plump, free from soft centers, but not rubbery when this firmness is attained.

The cubes of curd will be about one-third smaller than they were when cut, as is shown in figure 5.

In learning to make brick cheese the beginner should follow closely the schedule of making operations which is given in this publication, until he becomes experienced enough to determine the desired firmness of the curd by its appearance and elasticity. If the curd is dipped into the forms too soon, the cheese will be soft, high in moisture, and perhaps acid in flavor. If it is removed too late, the curd will be hard, low in moisture, slow to cure, and may even resemble Cheddar cheese in body and flavor.

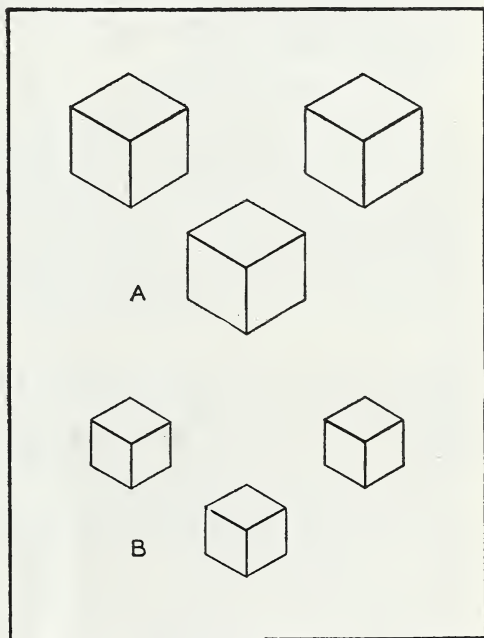


FIGURE 5.—Diagram showing (A) actual size of $\frac{3}{4}$ -inch cubes of curd at cutting, and (B) approximate size of same cubes at dipping.

DIPPING THE CURD

The curd and whey should be dipped from the vat with a flat-sided pail or scoop and poured quickly into the forms.

The forms should be arranged close together on the draining table, as shown in figure 2, *I*, to avoid spilling curd when it is dipped into them and to keep the curd warm. Under the forms should be spread a single thickness of coarse, clean burlap. It is desirable to scald the forms, draining table, and burlap draining cloth with hot water just before dipping the curd. Care must be taken to put approximately the same amount of curd and whey into each form so that the cheese will be uniform in weight and thickness. Fifty to fifty-five pounds of milk containing 3.5 percent of butterfat will make a cheese that weighs approximately 5 pounds.

PRESSING AND DRAINING THE CHEESE

From 20 to 30 minutes after the curd is dipped into the forms or as soon as the curd has settled, each cheese is turned with its form, and a follower is placed on it. Each cheese should be turned about 5 times at intervals of 30 minutes to insure uniform draining, even reduction of temperature, and level surfaces. After 2 or 3 turnings a weight is placed on the follower. Ordinary building bricks weighing about 5 pounds each are suitable for this purpose; those with glazed surfaces are preferable as they are easier to clean. Every time a cheese is turned over, the follower and weight should be replaced. The cheese should be allowed to drain under pressure overnight or at least for 12 to 16 hours. If the room is cold, an extra burlap draining cloth should be spread over the forms to help retain the heat.

SALTING THE CHEESE

The following morning the forms are removed. If the dry-salting process is to be used, the loaves of cheese are placed on a salting table, as shown in figure 6, *A*. Each cheese is rubbed with coarse salt and placed on one of its broad sides. This treatment is repeated for three successive mornings. If a cheese is salted too lightly, the rind will be thin and soft, the cheese will bulge and lose its original shape, and will not develop the characteristic brick cheese flavor. If the cheese is salted too heavily, it will form a hard, thick rind, the body of the cheese will be too firm or stiff, and the cheese will have a salty flavor.

On the fourth morning each cheese should be scraped with a dull knife to fill any openings and to smooth the surfaces before it is placed on the shelves in the curing room.

If the brine process of salting is used, the loaves of cheese are placed in a tank that contains saturated brine (fig. 6, *B*). The brine should have a specific gravity of 1.15107, which is equal to 19.03° Baumé at 60° F., or 75.5° salinometer at 60° F. Brine in which an egg will just float is also of the proper strength. This brine can be made by adding about 35 pounds of salt to each 100 pounds of water. There should be some undissolved salt in the bottom of the tank at all times. If the proper strength of the brine is not maintained, the brine will have an unpleasant odor after continued use. The temperature of the brine in the tank should be kept at about 55° to 60°. When a cheese is

removed from its form it can be placed at once in the brine. Cheese will float so that salt will not be absorbed from the brine by the upper side. It is therefore customary to sprinkle a little salt on the top of each cheese. After 24 hours each cheese should be turned so that its surfaces will get a more nearly equal exposure, then left in the brine another day, or about 48 hours in all.

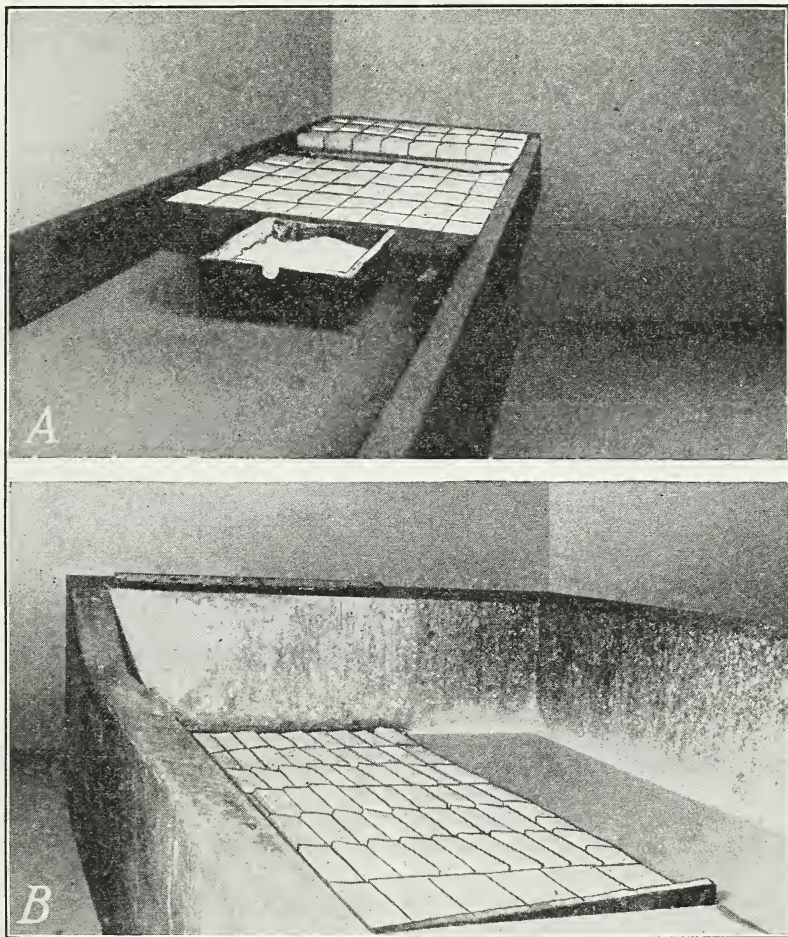


FIGURE 6.—Two methods of salting brick cheese: *A*, Dry salting, showing loaves of cheese on the salting table; *B*, salting in brine, showing loaves of cheese floating in brine in a brine tank.

RIPENING THE CHEESE

When the salting is completed the loaves of cheese are placed on clean shelves in the curing room or cellar, as shown in figure 7. The curing room should be held at a temperature of from 60° to 65° F. with a relative humidity of 90 percent. If it is necessary to maintain the humidity artificially, this can be done by sprinkling or spraying water on one side of the room and allowing it to run across the floor to the drain. Turning live steam into the curing room will raise the humid-

ity, but it will also raise the temperature, which is not always desirable. If the expense is justified, special humidifiers can be installed.

Cheese must be kept moist to prevent cracking of the rind and to encourage the growth of the organisms that cause a reddish brown color to develop gradually on the surface. To keep the surface moist leave no space between the loaves of cheese the first 10 or 12 days in the curing room. Usually a period of about 12 days is required for this change in the cheese to take place. During this time each cheese is washed frequently to prevent growth of mold and to aid in the formation of a proper rind.

A weak brine solution, which is made by adding a handful of salt to a pail of fresh, clean water, is used for washing the cheese.

At the end of about 12 days the cheese surfaces will be clean, smooth, free from cracks and holes, and should be somewhat sticky but not

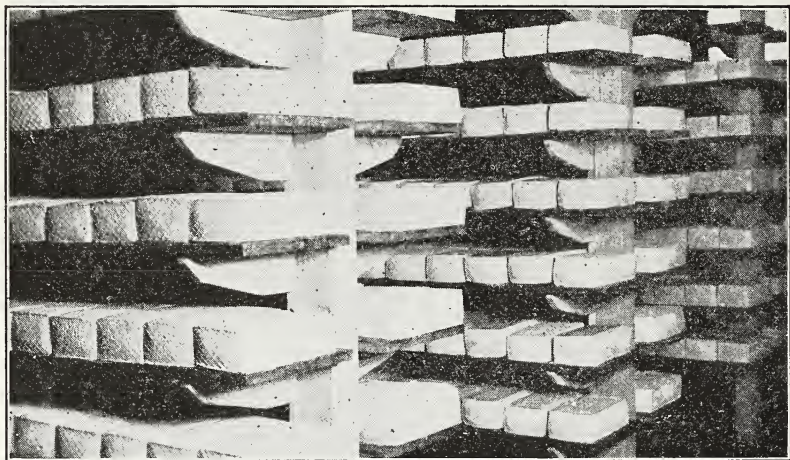


FIGURE 7.—Brick cheese on shelves in curing room.

smeary. At this time the surfaces are partly dried by separating the loaves of cheese on the shelves to permit circulation of air or by removing to a cool, dry room. Usually a period of about 2 days is required to dry a cheese sufficiently for paraffining or wrapping.

Each cheese is paraffined by dipping it for about 6 seconds in paraffin which is heated to a temperature of from 210° to 220° F. Usually several are dipped at once by means of a rack such as that shown in figure 2, *K*, but when brick cheese is made on a small scale each cheese can be submerged by hand in a tank similar to that in figure 2, *J*. Although brick cheese is usually paraffined, this is not essential except to avoid excessive drying.

Each cheese, whether it is paraffined or not, is wrapped in a sheet of parchment or waterproof paper and then in a second sheet of heavy manila paper. Brick cheese is usually packed in a box, ready for storage or shipment.

Table 1 shows box standards for brick cheese in Wisconsin, adopted by order of the Wisconsin Department of Agriculture and Markets.

TABLE 1.—*Box standards for brick cheese in Wisconsin, effective Oct. 25, 1934*

Style of box	Outside length	Inside width	Inside depth
	<i>Inches</i>	<i>Inches</i>	<i>Inches</i>
Full size.....	32	21	5½
Half size.....	32	10½	5½
Quarter size.....	18	10½	5½

The curing, however, is not actually complete at the time the cheese is wrapped and packaged. An additional ripening period is necessary to develop the smooth body and characteristic flavor of high-quality brick cheese. This second stage of ripening varies from a few days to several months, depending on the characteristics of the cheese, the flavor which is desired in the finished product, and the temperature of curing. High curing temperatures and long periods of holding tend to produce more pronounced flavors. Conditions during this ripening period must be carefully controlled to produce the quality desired by the market. A ripening temperature of 40° to 50° F. for a period of 12 weeks should produce a pleasing body and flavor in cheese manufactured according to the directions given in this circular.

APPEARANCE AND QUALITY

A loaf of brick cheese should be about 3 by 5 by 10 inches in size and weigh approximately 5 pounds. The sides should be straight and not bulged. The cheese should have a clean, smooth rind, free from cracks and openings. The flavor should be clean and mild, never sharp; the body smooth and waxy; the texture may be close or open, but must be free from gas holes. The cheese may be white or colored, but should always be uniform in color.

YIELD

The amount of cheese that can be made from 100 pounds of milk is dependent on the percentage of moisture in the cheese, the percentage of butterfat and the percentage of solids not fat in the milk from which the cheese is made, and the mechanical losses during the manufacturing process. Under ordinary conditions 100 pounds of milk testing 3.5 percent butterfat will make about 9½ pounds of brick cheese of good quality. Such cheese will contain approximately 39 percent moisture.

Some brick cheese is made that contains 42 to 44 percent moisture. It has a soft body and frequently a flavor like that of Limburger, both of which qualities are greatly appreciated in some markets. This product, however, does not store well.

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